MATH 223. Calculus for Science and Engineering III (3)

SYLLABUS SPRING 2008

Course Description: Introduction to vector algebra; lines and planes. Functions of several variables: partial derivatives, gradients, chain rule, directional derivative, maxima/minima. Multiple integrals, cylindrical and spherical coordinates. Derivatives of vector valued functions, velocity and acceleration. Vector fields, line integrals, Green's theorem. Prereq: MATH 122.

Instructor: Peter Thomas (pjthomas -- at -- case.edu)
Office Hours: Tues & Thurs 2:45-4:15 p.m. or by appointment.
Course Meetings: Tues & Thurs 10:00-11:15 a.m.

Text: Edwards & Penney Calculus / Early Transcendentals 7th Ed.
Software: No software will be required for this course. However, students are encouraged to avail themselves of software tools such as Mathematica and Matlab, both available from software.case.edu, as well as open source tools such as Octave and Scientific Python, for aid in learning the course material.
Exams: Midterm Exams will be held in class on 2/14, 3/6, and 4/17. The final will be on Friday, May 2 from 4:00 - 7:00 p.m.

Requirements

Twice weekly reading assignments, practice exercises, and classroom demonstrations. There will be three one-hour midterm exams and one three-hour cumulative final exam. Conflicting travel arrangements will not be grounds for making up exams. Please notify the instructor NOW if you anticipate any problem with the exam dates.

The grade will be based *approximately* on the following:
10% practice exercises, class attendance, participation, homework, demonstrations, *et cetera*
15% midterm I (Chapter 11)
15% midterm II (Chapters 11 & 12 -- emphasis on new material)
15% midterm III (Chapters 11, 12 & 13 -- emphasis on new material)
45% final exam (Chapters 11, 12, 13 & 14 -- new material & cumulative)

Syllabus

(14 weeks, 28 class meetings)

Chapter 11. Vectors, Curves and Surfaces in Space

week 1. (1/15, 1/17)
    11.1-2 Planar Vectors & Vectors in 3D
    11.3 Cross Product
week 2. (1/22, 1/24)
    11.4 Lines and Planes in 3D
    11.5 Curves and Motions in Space
week 3. (1/29, 1/31)

11.6 Curvature and Acceleration
11.7 Cylinders and Quadric Surfaces
week 4 (2/5, 2/7)
11.8 Cylindrical and Spherical Coordinates

Chapter 12. Partial Differentiation

week 4 (2/5, 2/7)
12.1-2 Introduction, Functions of Several Variables
week 5. (2/12, 2/14)
12.3 Limits and Continuity
EXAM (Chapter 11) Thursday 2/14
week 6. (2/19, 2/21)
12.4 Partial Derivatives
12.5 Multivariable Optimization Problems
week 7. (2/26, 2/28)
12.6 Increments and Linear Approximation
12.7 The Multivariable Chain Rule
week 8. (3/4, 3/6)
12.8 Directional Derivatives and the Gradient Vector
12.9 Lagrange Multipliers and Constrained Optimization
12.10 Critical Points of Functions of Two Variables

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Chapter 13. Multiple Integrals

week 9. (3/18, 3/20)
13.1 Double Integrals
EXAM (Chapter 12 sections 1-9) Thursday 3/20

week 10. (3/25, 3/27)
13.2 Double Integrals over More General Regions
13.3 Area and Volume by Double Integration
13.4 Double Integrals in Polar Coordinates
week 11. (4/1, 4/3)
13.5 Applications of Double Integrals
13.6 Triple Integrals
13.7 Integration in Cylindrical and Spherical Coordinates
week 12. (4/8, 4/10)
13.8 Surface Area
13.9 Change of Variables in Multiple Integrals

Chapter 14. Vector Calculus
week 13. (4/15, 4/17)
14.1 Vector Fields
14.2 Line Integrals
EXAM (Chapter 13) Thursday 4/17

week 14. (4/22, 4/24)

14.3 The Fundamental Theorem and Independence of Path

14.4 Green's Theorem

Supplemental materials:

Div, Grad, Curl and All That by H.M. Schey

Advanced Engineering Mathematics by Erwin Kreyszig

"il libro della natura e scrito in lingua mathematica"

(The book of nature is written in the language of mathematics)

-- Galileo Galilei